ZETA-RATS

Radar altimeter test system

ZETA-RATS tests and verifies radar altimeter systems under different scenarios. The radar altimeter's transmission is received and converted to IF, sampled and processed in DRFM blocks, and returned at the altimeter frequency as a ground echo with the delay and attenuation of the instantaneous altitude in the flight profile. Multipath reflections are added to the same scenario. The system consists of the radar altimeter echo simulator unit, receive and transmit antenna coupling units, a positioning mechanism for the coupling units, automatic test (ATE) software and an operator interface. It is used on the aircraft, in hardware-in-the-loop (HWIL) and in software-in-the-loop (SIL) set-ups, on rotary-wing and fixed-wing platforms.

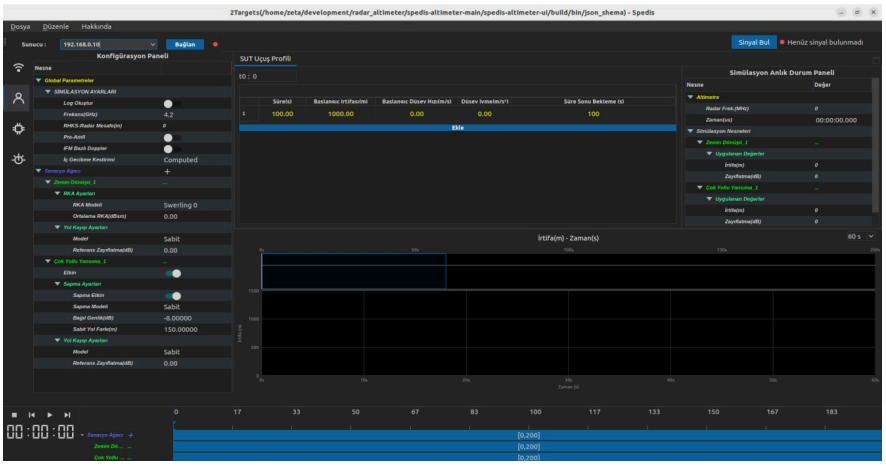


Figure 1. ZETA-RATS operator screen with scenario tree, flight profile table, simulation status panel and altitude–time graph

AT A GLANCE

FREQUENCY RANGE
3 GHz – 18 GHz and 24 GHz – 30 GHz (adjustable centre frequency)

INSTANTANEOUS BANDWIDTH
500 MHz

SUPPORTED SIGNALS
FMCW and pulsed

INPUT SIGNAL LEVEL
−30 dBm to 0 dBm

OUTPUT DYNAMIC RANGE
80 dB block (40 dB instantaneous)

APPLICATIONS

- Radar altimeter testing on rotary-wing and fixed-wing aircraft
- Radar altimeter verification in HWIL and SIL test set-ups
- Fault finding and acceptance testing of radar altimeter systems

Key Features

- DRFM ground return
- Fixed and dynamic flight profiles
- Multipath reflections
- Altimeter signal detection
- Testing on the aircraft
- Calibration, built-in test and automation

Capabilities

DRFM ground return

The simulator returns the altimeter's own FMCW or pulsed signal with the delay of the simulated altitude at 1 m resolution. Ground return uses Swerling 0 to IV radar cross-section models from −60 to +60 dBsm, with a fixed or two-way path loss model.

Fixed and dynamic flight profiles

The flight profile is a sequence of steps with start time, duration, start altitude, vertical velocity, vertical acceleration and hold time. Scenarios are saved, reloaded and played back on a timeline, and instantaneous values are logged every millisecond.

Multipath reflections

Multipath echoes follow a fixed path difference, a double-bounce model (aircraft to ground and back twice) or random ground points that change during the scenario, with relative amplitude from −40 to −10 dB and path differences from 1 to 5000 m.

Altimeter signal detection

A signal detection mode shows the 500 MHz band around the chosen centre frequency, with frequency–time and amplitude–time graphs, max hold, and measured pulse rate, PRI, frequency and amplitude of the altimeter signal.

Testing on the aircraft

Receive and transmit antenna coupling units are positioned under the altimeter antennas on tripods and adapted to the fuselage and antenna size. The echo simulator unit is portable and rugged, and the operator tablet connects over Ethernet so that one person runs the test from the cockpit.

Calibration, built-in test and automation

Internal delay calibration runs in 100 MHz steps with the RF output looped back to the input, without external test equipment. Built-in test reports the status of the DRFM channels, frequency converters and software services. Test logs, detailed fault reporting and an ATE software interface support fault finding and automated testing.

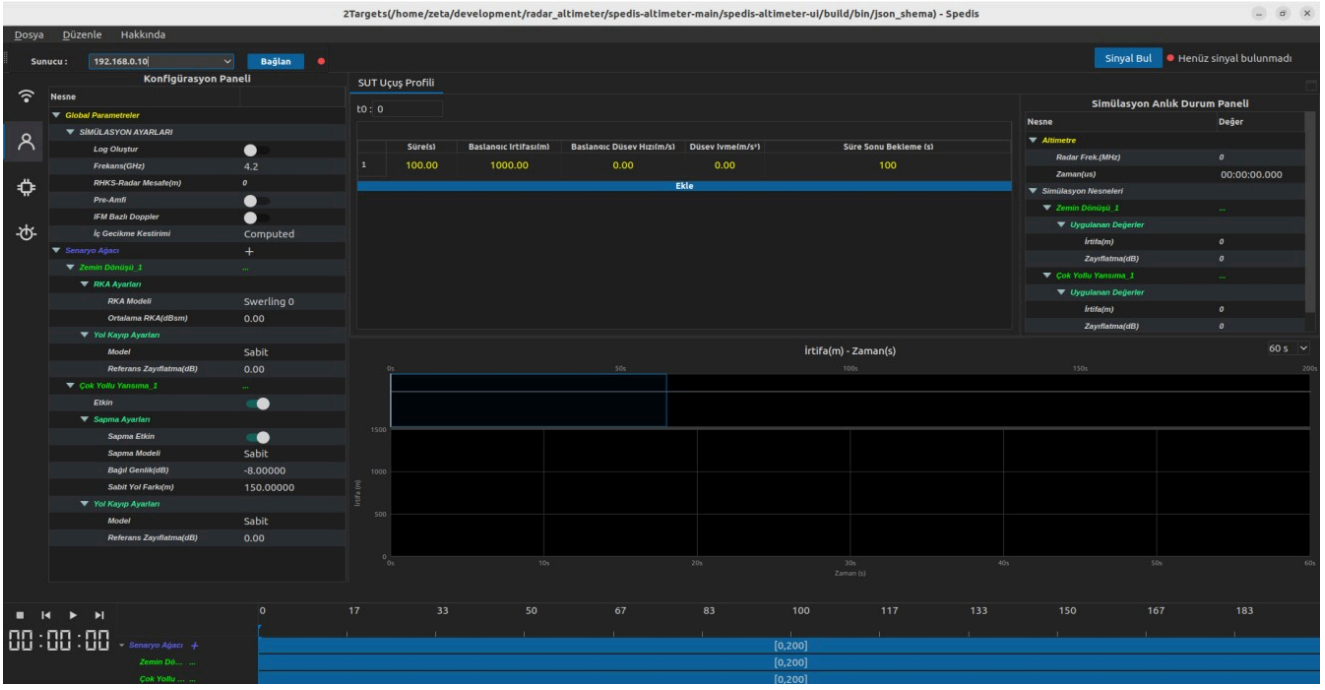


Figure 2. Operator mode: scenario tree with ground return and multipath settings, flight profile table and simulation status panel

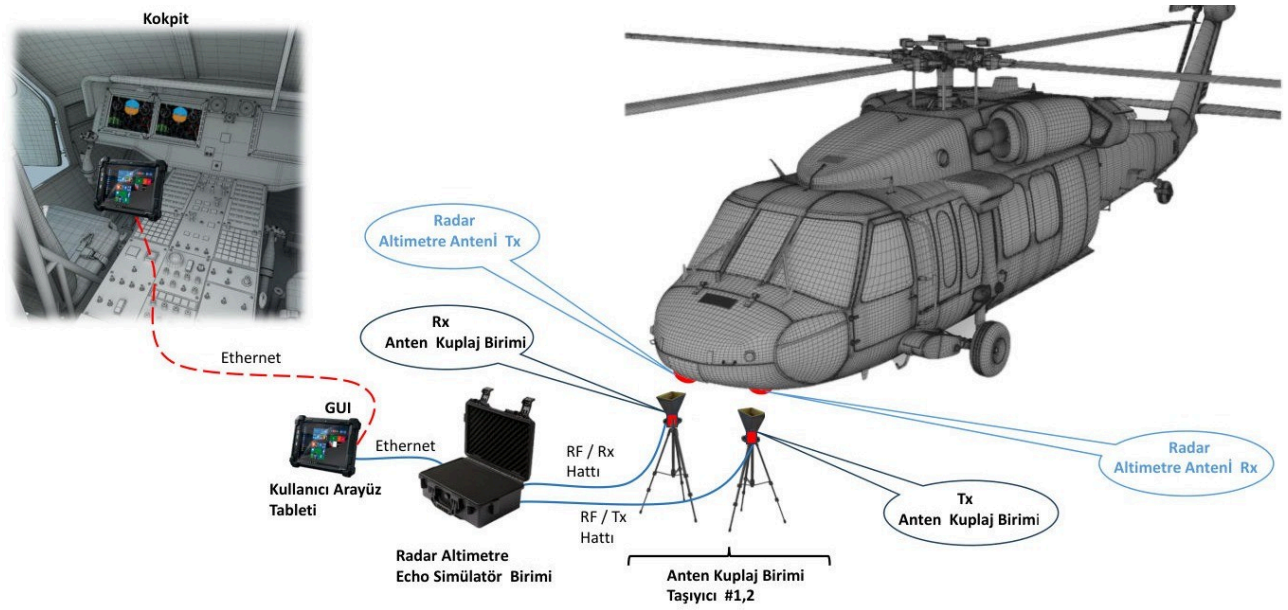


Figure 3. Usage concept on the aircraft: echo simulator unit, antenna coupling units on tripods and operator tablet connected to the cockpit

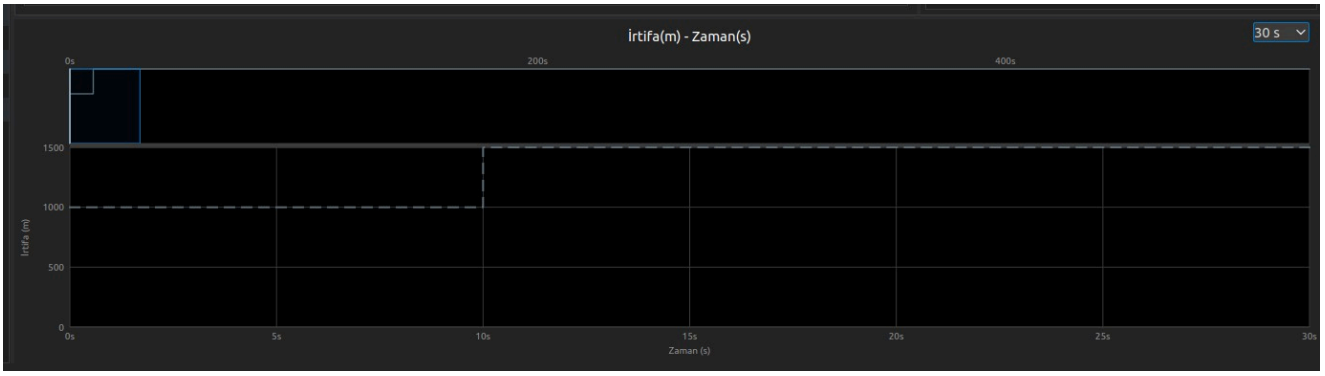


Figure 4. Altitude–time graph of a running simulation

Specifications

General	
Frequency range	3 GHz – 18 GHz and 24 GHz – 30 GHz (adjustable centre frequency)
Instantaneous bandwidth	500 MHz
Supported signals	FMCW and pulsed
Input signal level	−30 dBm to 0 dBm
Output dynamic range	80 dB block (40 dB instantaneous)
Range resolution	1 m
Vertical velocity	0 – 30,000 m/s, 1 m/s resolution
Radar cross-section	−60 dBsm to +60 dBsm, 1 dB resolution
Form factor	19-inch rack, 2U
Weight	< 20 kg
Operating temperature	0 °C – 50 °C

Warranty

All hardware and software procured from Zeta is under warranty against manufacturing or design failures for 2 years. Customer-specific warranty terms may be arranged.

Disclaimer

Due to ongoing research and development, Zeta reserves the right to change product specifications without notice.

About Zeta

Zeta Defence develops electronic intelligence (ELINT) and communication intelligence (COMINT) equipment and radar / electronic warfare simulators. Its capabilities include RF transceiver system design, digital design and large-scale software development.

Contact

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